UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/517,895	12/13/2004	Masahiro Inoue	F-8488	5714

28107 7590 11/14/2008

JORDAN AND HAMBURG LLP
122 EAST 42ND STREET
SUITE 4000
NEW YORK, NY 10168

EXAMINER	
SCHINDLER, DAVID M	

ART UNIT	PAPER NUMBER
2862	

MAIL DATE	DELIVERY MODE
11/14/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/517,895	INOUE, MASAHIRO	
	Examiner	Art Unit	
	DAVID M. SCHINDLER	2862	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 July 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *3,5,7-12 and 14-21* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *3,5,7-12 and 14-21* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *13 December 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *2/15/2008*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This action is in response to the communication filed 7/16/2008. In view of the rejection found below, the previously indicated allowable subject matter of claims 5, 10, and 11 is withdrawn.

Response to Arguments

2. Applicant's arguments with respect to the pending claims have been considered but are moot in view of the new ground(s) of rejection.

3. With regard to applicant's arguments directed at previously applied references, please see the rejection below.

4. The Examiner acknowledges applicant's statement with regard to the information disclosure statement (IDS). The Examiner has included a copy of the IDS with this office action.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claim 11 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

7. As to Claim 11,

8. The phrase "an outer raceway portion" on line 1 of page 11 of the claims in combination with the non-rolling element being an outer ring recited on line 12 of page 11 of the claims is not clearly understood. It appears that this claim is directed towards applications Figure 10, and the difference between the outer raceway portion and the outer ring is not clear.

9. The phrase "a second inner raceway groove" on line 9 of page 11 of the claims is awkward in that a first inner raceway groove was not previously introduced.

10. The phrase "a second inner raceway groove diameter" on lines 9-10 is likewise awkward as a first inner raceway groove was not previously introduced.

11. The phrase "said first inner raceway groove diameter" on lines 10-11 lacks antecedent basis. The Examiner notes that an outer raceway portion with a first outer raceway groove, along with a first outer raceway groove diameter has been introduced in lines 1-3 of page 11 of the claims, and it appears from this that applicant may have meant for this to use the term inner instead of outer for these features.

12. The phrase "said non-rolling element being an outer ring disposed concentrically with said hub wheel and having first and second inner raceway grooves in an inner circumferential surface

respectively opposing said first and second inner raceway grooves" on lines 12-15 of page 11 of the claims is not clearly understood. It is not clear how the first and second inner raceway grooves can be opposed to themselves.

Claim Rejections - 35 USC § 102

13. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless -
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

14. Claims 3 and 21 are rejected under 35 U.S.C. 102(b) as being anticipated by Watanabe et al. (Watanabe) (5,914,548).

15. As to Claim 3,

16. Watanabe discloses a rolling element ((12) in combination with the rolling ring of (17), the rolling ring of (18), and 29)) formed as an inner ring of a bearing, a non-rolling element (11) disposed concentrically with the rolling element, and a rotation detector (26) for outputting an input exciting voltage by converting it to an induced voltage according to a relative rolling state of the rolling element and the non-rolling element, the rotation detector including a rotor ((29) in combination with the flat portion of (12) that (29) is attached

to) (Figure 4) provided as part of the inner ring, a stator (28) provided in the non-rolling element, and an exciting winding and output windings wound to the stator, wherein the output windings output the voltage induced according to a gap permeance between the rotor and the stator in response to the exciting voltage inputted to the exciting winding (note variable reluctance resolver in column 7, Lines 1-10), the stator including a plurality of polar teeth opposing the rolling element, the exciting winding and output windings being wound to each polar teeth of the stator, and the rotor including a flat portion on a portion of a circumferential surface of the inner ring which opposes the plurality of teeth and is an outer peripheral shoulder of the inner ring ((Figures 2 and 4) and (Column 4, Lines 44-62) and (Column 6, Lines 40-54 and lines 66-67) and (Column 7, Lines 1-37) and (Column 9, Lines 19-25 and lines 55-67) and (Column 15, Lines 11-21)).

17. (It is first noted that the inner rings of (17) and (18), along with (12) and (29) are all integrated and rotate as one unit. The Examiner is interpreting these components as a whole to be the rolling element formed as an inner ring of a bearing. Secondly, it is noted that there is a flat portion in (12) (note the wall to the right of (29). Additionally, it appears that the teeth of (29) (see Figure 2) appear to be flat along each

tooth's right at left side, and along the top of each tooth and thus also include the flat portion feature).

18. As to Claim 21,

19. Watanabe discloses a rolling element ((12) in combination with the rolling ring of (17), the rolling ring of (18), and 29)) including a first raceway wheel, a non-rolling element ((11) in combination with the non-rolling ring of (17) and (18)) disposed concentrically with the rolling element and including a second raceway wheel, the rolling element rolling with respect to the non-rolling element, a rotation detector (26) providing an induced voltage output produced from an input exciting voltage and influenced according to a gap permeance related to a relative rolling state of the rolling element and the non-rolling element, a rotor ((29) in combination with the flat portion of (12) that (29) is attached to) disposed in the rolling element, a stator disposed in the non-rolling element, an exciting winding and output windings disposed on the stator, the exciting winding being excited by the exciting voltage and the output winding providing the induced voltage output, the rotor and the stator being disposed opposing one another in an annular space between the rolling element and the non-rolling element (note Figure 2 in conjunction with Figure 4), and the output windings outputting the induced voltage output at a level

determined by the gap permeance between the rotor and the stator and by the input exciting voltage, wherein the rolling element is an inner ring of a bearing and the non-rolling element is an outer ring of the bearing, and the rotor is formed of the inner ring and includes a flat portion of an outer circumferential surface of the inner ring ((Figures 2-4) and (Column 4, Lines 44-62) and (Column 6, Lines 40-54 and lines 66-67) and (Column 7, Lines 1-37) and (Column 9, Lines 19-25 and lines 55-67) and (Column 15, Lines 11-21)).

20. (It is first noted that the inner rings of (17) and (18), along with (12) and (29) are all integrated and rotate as one unit. The Examiner is interpreting these components as a whole to be the rolling element formed as an inner ring of a bearing. Secondly, it is noted that there is a flat portion in (12) (note the wall to the right of (29). Additionally, it appears that the teeth of (29) (see Figure 2) appear to be flat along each tooth's right at left side, and along the top of each tooth and thus also include the flat portion feature).

Claim Rejections - 35 USC § 103

21. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

22. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

23. Claims 3, 19, 20, and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rigaux et al. (Rigaux) (US 5,624,192) in view of Watanabe et al. (Watanabe) (US 5,914,548).

24. As to Claim 3,

25. Rigaux discloses a rolling element (12) formed as an inner ring of a bearing, a non-rolling element (11) disposed concentrically with the rolling element, a rotation detector ((19),(17), and the flat portions that (19) sits in / note for example that (27) has a flat portion and note the teeth (24)) for outputting an induced voltage produced by a relative rolling state of the rolling element and the non-rolling element, the

rotation detector including a rotor (19) provided as part of the inner ring (note that (19) is embedded in (12), the rotor including a flat portion on a portion of a circumferential surface of the inner ring which is an outer peripheral shoulder of the inner ring (Figure 2) ((Figures 2-4) and (Abstract)).

26. Rigaux does not disclose a rotation detector for outputting an induced voltage produced by an input exciting voltage according to a relative rolling state of the rolling element and the non-rolling element, the rotation detector including an exciting winding and output windings wound to the stator, wherein the output windings output the induced voltage induced according to a gap permeance between the rotor and the stator in response to the exciting voltage inputting to the exciting winding, the stator including a plurality of polar teeth opposing the rolling element, and the exciting winding and output windings being wound to each of the polar teeth of the stator, and the rotor includes a flat portion on a portion of a circumferential surface of the inner ring which opposes the plurality of polar teeth, and a stator provided on the non-rolling element.

27. Watanabe discloses a rotation detector (26) for outputting an induced voltage produced by an input exciting voltage according to a relative rolling state of the rolling element and

the non-rolling element, the rotation detector including an exciting winding and output windings wound to the stator (28), wherein the output windings output the induced voltage induced according to a gap permeance between the rotor (29) and the stator in response to the exciting voltage inputting to the exciting winding, the stator including a plurality of polar teeth opposing the rolling element, and the exciting winding and output windings being wound to each of the polar teeth of the stator, and the rotor includes a flat portion on a portion of a circumferential surface of the inner ring which opposes the plurality of polar teeth, a stator provided on the non-rolling element. ((Figures 2-4) and (Column 4, Lines 44-62) and (Column 6, Lines 40-54 and lines 66-67) and (Column 7, Lines 1-37) and (Column 9, Lines 19-25 and lines 55-67) and (Column 15, Lines 11-21)).

28. It would have been obvious to a person of ordinary skill in the art at the time of invention to modify Rigaux to include replacing the sensing system including encoder (360) and stator/sensor (50) with the resolver of Watanable to therefore include a rotation detector for outputting an induced voltage produced by an input exciting voltage according to a relative rolling state of the rolling element and the non-rolling element, the rotation detector including an exciting winding and

output windings wound to the stator, wherein the output windings output the induced voltage induced according to a gap permeance between the rotor and the stator in response to the exciting voltage inputting to the exciting winding, the stator including a plurality of polar teeth opposing the rolling element, and the exciting winding and output windings being wound to each of the polar teeth of the stator, and the rotor includes a flat portion on a portion of a circumferential surface of the inner ring which opposes the plurality of polar teeth as it would have been obvious to a person of ordinary skill in the art to try various desired sensing arrangements, substitute known equivalent sensing techniques (MPEP 2144.06), and to use simple substitution of one known sensing system for another to yield predicable results in order to utilize a readily available sensing system that provides for high-resolution rotation detection (Column 7, Lines 1-5).

29. As to Claim 19,

30. Rigaux in view of Watanabe discloses the rotation detector includes a resolver which induces the voltage according to a gap permeance between the rotor and the stator in response to an exciting voltage inputted to the exciting winding from the output windings ((Figures 2-4) and (Column 4, Lines 44-62) and (Column 6, Lines 40-54 and lines 66-67) and (Column 7, Lines 1-

37) and (Column 9, Lines 19-25 and lines 55-67) and (Column 15, Lines 11-21)).

31. As to Claim 20,

32. Rigaux discloses the non-rolling element opposes the rolling element in at least in part in a radial direction of the rolling bearing apparatus (Figures 2-4).

33. As to Claim 21,

34. Rigaux discloses a rolling element (12) including a first raceway wheel, a non-rolling element (11) disposed concentrically with the rolling element and including a second raceway wheel, the rolling element rolling with respect to the non-rolling element, a rotation detector ((19),(17), and the flat portions that (19) sits in / note for example that (27) has a flat portion and note the teeth (24)) for providing an induced voltage produced and influenced by a relative rolling state of the rolling element and the non-rolling element, a rotor ((19) and the flat portions that (19) sits in / note for example that (27) has a flat portion and note the teeth (24)) disposed in the rolling element, the rolling element is an inner ring of a bearing and the non-rolling element is an outer ring of the bearing, and the rotor is formed of the inner ring and includes a flat portion on a circumferential surface of the inner ring ((Figures 2-4) and (Abstract)).

35. Rigaux does not disclose a rotation detector for providing an induced voltage produced from an input exciting voltage according to a relative rolling state of the rolling element and the non-rolling element, an exciting winding and output windings disposed on the stator, wherein the exciting winding being excited by the exciting voltage and the output winding providing the induced voltage output, the rotor and stator being disposed opposing one another in an annular space between the rolling element and the non-rolling element, and the output windings outputting the induced voltage at a level determined by the gap permeance between the rotor and the stator and by the input exciting voltage, and a stator disposed in the non-rolling element.

36. Watanabe discloses a rotation detector (26) for providing an induced voltage produced from an input exciting voltage according to a relative rolling state of the rolling element and the non-rolling element, an exciting winding and output windings disposed on the stator, wherein the exciting winding being excited by the exciting voltage and the output winding providing the induced voltage output, the rotor and stator being disposed opposing one another in an annular space between the rolling element and the non-rolling element, and the output windings outputting the induced voltage at a level determined by the gap

permeance between the rotor and the stator and by the input exciting voltage, and a stator disposed in the non-rolling element. ((Figures 2-4) and (Column 4, Lines 44-62) and (Column 6, Lines 40-54 and lines 66-67) and (Column 7, Lines 1-37) and (Column 9, Lines 19-25 and lines 55-67) and (Column 15, Lines 11-21)).

37. It would have been obvious to a person of ordinary skill in the art at the time of invention to modify Rigaux to include replacing the sensing system including encoder (360) and stator/sensor (50) with the resolver of Watanable to therefore include a rotation detector for providing an induced voltage produced from an input exciting voltage according to a relative rolling state of the rolling element and the non-rolling element, an exciting winding and output windings disposed on the stator, wherein the exciting winding being excited by the exciting voltage and the output winding providing the induced voltage output, the rotor and stator being disposed opposing one another in an annular space between the rolling element and the non-rolling element, and the output windings outputting the induced voltage at a level determined by the gap permeance between the rotor and the stator and by the input exciting voltage as it would have been obvious to a person of ordinary skill in the art to try various desired sensing arrangements,

substitute known equivalent sensing techniques (MPEP 2144.06), and to use simple substitution of one known sensing system for another to yield predicable results in order to utilize a readily available sensing system that provides for high-resolution rotation detection (Column 7, Lines 1-5).

38. Claims 5 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Iwamoto et al. (Iwamoto) (US 2001/0030533 A1) in view of Watanable et al. (US 5,914,548).

39. As to Claim 5,

40. Iwamoto discloses a rolling element (21), a non-rolling element (22) disposed concentrically with the rolling element, a rotation detector ((2),(1),(5)) for outputting an induced voltage according to a relative rolling state of the rolling element and the non-rolling element, the rotation detector including a rotor ((1),(2)) provided on the rolling element, a stator (the casing for the magnetic sensor) provided on the non-rolling element, the rolling element being made up of two inner rings (Figure 12) disposed adjacent to each other in an axial direction and each having an inner ring raceway groove (Figure 12), the rotor being provided at an area whereat outer peripheral annual surface areas of the two inner rings oppose each other in the axial direction (Figure 12), the non-rolling

element being an outer ring disposed concentrically with the two inner rings in an outward-radial direction (Figure 12), the outer ring having two outer ring raceway grooves in an inner peripheral surface thereof (Figure 12), the two outer ring grooves being separated away from each other in an axial direction and opposing respective ones of the inner ring raceway grooves of the two inner rings (Figure 12), the stator being provided in a region between the outer ring raceway grooves of the outer ring, the rotor having first and second inner circumferential surfaces disposed adjacent each other in the axial direction (Figure 12), the inner rings respectively having inner ring outer circumferential surface end portions adjacent one another in the axial direction (Figure 12), the rotor being fixed by fixedly fitting the first inner circumferential surface onto the inner ring outer circumferential surface end portion of one of the inner rings, the second inner circumferential surface having a greater diameter than the inner ring outer circumferential surface end portion of another one of the inner rings and being disposed opposing the inner ring outer circumferential surface end portion of the another one of the inner rings and out of contact with the inner ring outer circumferential portion of the another one of the inner rings

such that the rotor does not contact the another one of the inner rings ((Figure 12) and (Paragraph [0080])).

41. Iwamoto does not disclose a rotation detector for outputting an induced voltage produced by an input exciting voltage according to a relative rolling state of the rolling element and the non-rolling element, an exciting winding and output windings wound to the stator, wherein the output windings output the induced voltage according to a gap permeance between the rotor and the stator in response to the exciting voltage inputted to the exciting winding.

42. Watanabe discloses a rotation detector (26) for providing an induced voltage produced from an input exciting voltage according to a relative rolling state of the rolling element and the non-rolling element, an exciting winding and output windings wound to the stator, wherein the output windings output the induced voltage according to a gap permeance between the rotor and the stator in response to the exciting voltage inputted to the exciting winding ((Figures 2-4) and (Column 4, Lines 44-62) and (Column 6, Lines 40-54 and lines 66-67) and (Column 7, Lines 1-37) and (Column 9, Lines 19-25 and lines 55-67) and (Column 15, Lines 11-21)).

43. It would have been obvious to a person of ordinary skill in the art at the time of invention to modify Iwamoto to include

replacing the sensing system of Iwamoto with the resolver of Watanable to therefore include a rotation detector for outputting an induced voltage produced by an input exciting voltage according to a relative rolling state of the rolling element and the non-rolling element, an exciting winding and output windings wound to the stator, wherein the output windings output the induced voltage according to a gap permeance between the rotor and the stator in response to the exciting voltage inputted to the exciting winding as it would have been obvious to a person of ordinary skill in the art to try various desired sensing arrangements, substitute known equivalent sensing techniques (MPEP 2144.06), and to use simple substitution of one known sensing system for another to yield predicable results in order to utilize a readily available sensing system that provides for high-resolution rotation detection (Column 7, Lines 1-5).

44. As to Claim 7,

45. Iwamoto in view of Watanabe do not explicitly disclose the exciting winding and the output windings are lead out from a through-hole provided in an area on a center of a circumference of the outer ring in an axial direction.

46. However, it would have been obvious to a person of ordinary skill in the art to modify Iwamoto in view of Watanabe to

include the exciting winding and the output windings are lead out from a through-hole provided in an area on a center of a circumference of the outer ring in an axial direction as it would have been obvious to try to provide a through-hole in any part of the outer ring in any location in order to allow the windings to be connected to components that receive and output signals to and from the windings. (Note the connections shown in Figure 3).

47. Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe et al. (Watanabe) (5,914,548) in view of Sakamoto (US 5,263,366).

48. As to Claim 8,

49. Watanabe discloses a rolling element, a non-rolling element disposed concentrically with the rolling element, and a rotation detector for outputting an input exciting voltage by converting it to an induced voltage according to a relative rolling state of the rolling element and the non-rolling element, the rotation detector including a rotor provided on the rolling element, a stator provided on the non-rolling element, and an exciting winding and output windings wound to the stator, wherein the output windings induce a voltage according to a gap permeance between the rotor and the stator in response to the exciting

voltage inputted to the exciting winding, the stator including a plurality of polar teeth provided in a surface of the non-rolling element which opposes the rolling element while the exciting winding and output windings are wound to each polar teeth of the stator ((Figures 2 and 4) and (Column 4, Lines 44-62) and (Column 6, Lines 40-54 and lines 66-67) and (Column 7, Lines 1-37) and (Column 9, Lines 19-25 and lines 55-67) and (Column 15, Lines 11-21)).

50. Watanabe does not disclose the rolling element includes a hub wheel, and an inner ring fitted on an outer periphery of the hub wheel, and the rotor being a nut mounted on the hub wheel so as to secure the inner ring to the hub wheel wherein the nut is hexagonal thus including flat portions which oppose the plurality of teeth and vary the gap permeance with rotation of the nut.

51. Sakamoto discloses the rolling element includes a hub wheel (Figure 2), and an inner ring (16) fitted on an outer periphery of the hub wheel, and the rotor being a nut including a series of evenly spaced grooves and ridges mounted on the hub wheel so as to secure the inner ring to the hub wheel wherein the nut includes a flat portion ((Figure 2) and (Column 6, Lines 36-68)).

52. It would have been obvious to a person of ordinary skill in the art at the time of invention to modify Watanabe to include the rolling element includes a hub wheel, and an inner ring fitted on an outer periphery of the hub wheel, and the rotor being a nut mounted on the hub wheel so as to secure the inner ring to the hub wheel wherein the nut includes flat portions which oppose the plurality of teeth and vary the gap permeance with rotation of the nut given the above disclosure and teaching of Sakamoto in order to allow for a smaller sized device (Column 6, Lines 66-68) and to reduce the number of components needed by using the nut as the rotor.

53. While Watanable in view of Sakamoto does not explicitly disclose that the nut is hexagonal including flat portions which oppose the plurality of teeth and vary the gap permeance with rotation of the nut, the Examiner notes that it would have been obvious to a person of ordinary skill in the art at the time of invention to try and utilize various nuts with a variety of shapes include a hexagonal nut, and furthermore it would have been obvious to a person of ordinary skill in the art at the time of invention to utilize known equivalent nuts (note applicant's statement on page 8 of the remarks that hexagonal nuts are conventional) (MPEP 2144.06)), and furthermore it would have been obvious to a person of ordinary skill in the art at

the time of invention to use simple substitution of one nut for another, to therefore include the nut is hexagonal and thus includes flat portions which oppose the plurality of teeth and vary the gap permeance with rotation of the nut in order to reduce the number of components needed by using the nut as the rotor.

54. As to Claim 9,

55. Watanabe does not disclose the hub wheel has first and second axial ends, the hub wheel has in sequential order a flange provided proximate the first axial end, a ring seat surface having a ring seat diameter and a threaded portion having an outer thread diameter less than the ring seat diameter, the inner ring is mounted on the ring seat surface, the threaded portion is at the second axial end of the hub wheel, and the nut is mounted to the hub wheel by being threaded on the threaded portion, the rotor being formed by the nut, the non-rolling element is an outer ring disposed concentrically about the hub wheel, a cap is mounted in an opening of the outer ring, and the stator is fixed to an inner periphery of the cap and the stator opposes the nut in a radial direction.

56. Sakamoto discloses the hub wheel has first and second axial ends, the hub wheel has in sequential order a flange (11) provided proximate the first axial end, a ring seat surface

(note the area ring 16 is seated in) having a ring seat diameter and a threaded portion having an outer thread diameter less than the ring seat diameter, the inner ring is mounted on the ring seat surface (Figure 2), the threaded portion is at the second axial end of the hub wheel, and the nut is mounted to the hub wheel by being threaded on the threaded portion, the rotor being formed by the nut, the non-rolling element is an outer ring disposed concentrically about the hub wheel, a cap is mounted in an opening of the outer ring, and the stator is fixed to an inner periphery of the cap and the stator opposes the nut in a radial direction ((Figure 2) and (Column 6, Lines 36-68).

57. It would have been obvious to a person of ordinary skill in the art at the time of invention to modify Watanabe to include the hub wheel has first and second axial ends, the hub wheel has in sequential order a flange (11) provided proximate the first axial end, a ring seat surface (note the area ring 16 is seated in) having a ring seat diameter and a threaded portion having an outer thread diameter less than the ring seat diameter, the inner ring is mounted on the ring seat surface (Figure 2), the threaded portion is at the second axial end of the hub wheel, and the nut is mounted to the hub wheel by being threaded on the threaded portion, the rotor being formed by the nut, the non-rolling element is an outer ring disposed concentrically about

the hub wheel, a cap is mounted in an opening of the outer ring, and the stator is fixed to an inner periphery of the cap and the stator opposes the nut in a radial direction as taught by Sakamoto in order to allow for a smaller sized device (Column 6, Lines 66-68), to reduce the number of components needed by using the nut as the rotor, and to provide for vehicular rotation detection.

58. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Rigaux et al. (Rigaux) (US 5,624,192) in view of Sakamoto (US 5,263,366) and Watanabe et al. (Watanabe) (US 5,914,548).

59. Rigaux discloses a rolling element (12), a non-rolling element (11) disposed concentrically with the rolling element, a rotation detector ((19),(17), and the notch that (19) sits in / note for example that (27) has a notch and note the teeth (24)) for outputting an induced voltage according to a relative rolling state of the rolling element and the non-rolling element, the rotation detector including a rotor ((19) and the notch in the inner rings that (19) sits in) provided on the rolling element (note that (19) is embedded in (12)), the rolling element including a hub wheel having first and second axial ends (Figure 1), the hub wheel having in sequential order

from the first axial end a flange (2) provided proximate the first end (Figure 1), an intermediate circumferential surface having a first diameter (Figure 1), a ring seat surface having a ring seat diameter (Figure 1), and a threaded portion having an outer thread diameter less than the ring seat diameter (note nut (9)) (Figure 1), and an inner ring mounted on the ring seat surface (Figure 1), the non-rolling element being an outer ring disposed on an outer periphery of the hub wheel (Figure 1), the rotor being formed by at least one notch provided at an area on the intermediate circumferential surface of the hub wheel ((note the notches in (21) that (23) fits into / these notches are at an area that is on the intermediate circumferential surface of the hub wheel) / and also note the notch in the inner rings that (19) sits in).

60. Rigaux does not disclose a rotation detector for outputting an induced voltage produced by an input exciting voltage according to a relative rolling state of the rolling element and the non-rolling element, the rotation detector includes a stator provided on the non-rolling element, and an exciting winding and output windings wound to the stator, wherein the output windings output the induced voltage induced according to a gap permeance between the rotor and the stator in response to the exciting voltage inputted to the exciting winding, the stator being

mounted in an axially center region of an inner circumferential surface of the outer ring, and a ring seat surface having a ring seat diameter less than the first diameter.

61. Watanabe discloses a rotation detector (26) for outputting an induced voltage produced from an input exciting voltage according to a relative rolling state of the rolling element and the non-rolling element, a stator (28) provided on the non-rolling element, an exciting winding and output windings wound to the stator, wherein the output windings output the induced voltage according to a gap permeance between the rotor and the stator in response to the exciting voltage inputted to the exciting winding, the stator being mounted in an axially center region of an inner circumferential surface of the outer ring ((Figures 2-4) and (Column 4, Lines 44-62) and (Column 6, Lines 40-54 and lines 66-67) and (Column 7, Lines 1-37) and (Column 9, Lines 19-25 and lines 55-67) and (Column 15, Lines 11-21)).

62. It would have been obvious to a person of ordinary skill in the art at the time of invention to modify Rigaux to include replacing the sensing system of Rigaux with the resolver of Watanable to therefore include a rotation detector for outputting an induced voltage produced by an input exciting voltage according to a relative rolling state of the rolling element and the non-rolling element, the rotation detector

includes a stator provided on the non-rolling element, and an exciting winding and output windings wound to the stator, wherein the output windings output the induced voltage induced according to a gap permeance between the rotor and the stator in response to the exciting voltage inputted to the exciting winding, the stator being mounted in an axially center region of an inner circumferential surface of the outer ring as it would have been obvious to a person of ordinary skill in the art to try various desired sensing arrangements, substitute known equivalent sensing techniques (MPEP 2144.06), and to use simple substitution of one known sensing system for another to yield predicable results in order to utilize a readily available sensing system that provides for high-resolution rotation detection (Column 7, Lines 1-5).

63. Sakamoto discloses a ring seat surface having a ring seat diameter less than the first diameter (Figure 1).

64. It would have been obvious to a person of ordinary skill in the art at the time of invention to modify Rigaux in view of Watanabe to include a ring seat surface having a ring seat diameter less than the first diameter as taught by Sakamoto because it would have been obvious to try a variety of ring seat diameters, and furthermore would have been obvious to change the shape (MPEP 2144.04) of the ring seat diameter in order to

utilize a desired ring size or desired bearing due to the cost and sizes of the available bearings for the device.

65. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Rigaux et al. (Rigaux) (US 5,624,192) in view of Sakamoto (US 5,263,366) and Watanabe et al. (Watanabe) (US 5,914,548) and Mizukoshi et al. (Mizukoshi) (US 6,250,811).

66. Rigaux discloses a rolling element (12), a non-rolling element (11) disposed concentrically with the rolling element, a rotation detector ((19),(17), and the notches that (19) sits in / note for example that (27) has a notch and note the teeth (24)) for outputting an induced voltage according to a relative rolling state of the rolling element and the non-rolling element, the rotation detector including a rotor ((19) and the notch in the inner rings that (19) sits in) provided on the rolling element (note that (19) is embedded in (12)), the rolling element including a hub wheel having first and second axial ends (Figure 1), the hub wheel having in sequential order from the first axial end a flange (2) provided proximate the first end (Figure 1), an outer raceway portion with first outer raceway groove having first outer raceway groove diameter (Figure 1), an intermediate circumferential surface having a first diameter (Figure 1), a ring seat surface having a ring

seat diameter (Figure 1), and a threaded portion having an outer thread diameter less than the ring seat diameter (note nut (9)) (Figure 1), and an inner ring mounted on the ring seat surface (Figure 1) and having a second inner raceway groove having a second inner raceway groove diameter less than the first inner raceway groove diameter, the non-rolling element being an outer ring disposed concentrically with the hub wheel and having first and second inner raceway grooves in an inner circumferential surface respectively opposing the first and second inner raceway grooves (Figure 1), a first set of balls disposed in the first inner and outer raceway grooves and having a first pitch circuit diameter, a second set of balls disposed in the second inner and outer raceway grooves, the rotor being formed by notches provided at a plurality of areas on the intermediate circumferential surface of the hub wheel ((note the notches in (21) that (23) fits into / these notches are at an area that is on the intermediate circumferential surface of the hub wheel) / and also note the notches in the inner rings that (19) sits in).

67. Rigaux does not disclose a rotation detector for outputting an induced voltage produced by an input exciting voltage according to a relative rolling state of the rolling element and the non-rolling element, the rotation detector includes a stator provided on the non-rolling element, and an exciting winding and

output windings wound to the stator, wherein the output windings output the induced voltage induced according to a gap permeance between the rotor and the stator in response to the exciting voltage inputted to the exciting winding, the stator being mounted in an axially center region of an inner circumferential surface of the outer ring, and a ring seat surface having a ring seat diameter less than the first diameter, and a second set of balls disposed in the second inner and outer raceway grooves having a second pitch circle diameter less than the first pitch circuit diameter.

68. Watanabe discloses a rotation detector (26) for outputting an induced voltage produced from an input exciting voltage according to a relative rolling state of the rolling element and the non-rolling element, a stator (28) provided on the non-rolling element, an exciting winding and output windings wound to the stator, wherein the output windings output the induced voltage according to a gap permeance between the rotor and the stator in response to the exciting voltage inputted to the exciting winding, the stator being mounted in an axially center region of an inner circumferential surface of the outer ring ((Figures 2-4) and (Column 4, Lines 44-62) and (Column 6, Lines 40-54 and lines 66-67) and (Column 7, Lines 1-37) and (Column 9, Lines 19-25 and lines 55-67) and (Column 15, Lines 11-21)).

69. It would have been obvious to a person of ordinary skill in the art at the time of invention to modify Rigaux to include replacing the sensing system of Rigaux with the resolver of Watanable to therefore include a rotation detector for outputting an induced voltage produced by an input exciting voltage according to a relative rolling state of the rolling element and the non-rolling element, the rotation detector includes a stator provided on the non-rolling element, and an exciting winding and output windings wound to the stator, wherein the output windings output the induced voltage induced according to a gap permeance between the rotor and the stator in response to the exciting voltage inputted to the exciting winding, the stator being mounted in an axially center region of an inner circumferential surface of the outer ring as it would have been obvious to a person of ordinary skill in the art to try various desired sensing arrangements, substitute known equivalent sensing techniques (MPEP 2144.06), and to use simple substitution of one known sensing system for another to yield predicable results in order to utilize a readily available sensing system that provides for high-resolution rotation detection (Column 7, Lines 1-5).

70. Sakamoto discloses a ring seat surface having a ring seat diameter less than the first diameter (Figure 1).

71. It would have been obvious to a person of ordinary skill in the art at the time of invention to modify Rigaux in view of Watanabe to include a ring seat surface having a ring seat diameter less than the first diameter as taught by Sakamoto because it would have been obvious to try a variety of ring seat diameters, and furthermore would have been obvious to change the shape (MPEP 2144.04) of the ring seat diameter in order to utilize a desired ring size or desired bearing due to the cost and sizes of the available bearings for the device.

72. Mizukoshi discloses second set of balls disposed in the second inner and outer raceway grooves having a second pitch circle diameter less than the first pitch circuit diameter (Figure 2).

73. It would have been obvious to a person of ordinary skill in the art at the time of invention to modify Rigaux in view of Watanabe and Sakamoto to include second set of balls disposed in the second inner and outer raceway grooves having a second pitch circle diameter less than the first pitch circuit diameter because it would have been obvious to try a variety of pitch circle diameters, and furthermore would have been obvious to change the shape (MPEP 2144.04) of the pitch circle diameter in order to utilize a desired ring size or desired bearing due to the cost and sizes of the available bearings for the device.

74. Claims 12 and 14-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe et al. (Watanabe) (US 5,914,548) in view of Okada et al. (Okada) (US 2002/0130655).

75. As to Claim 12,

76. Watanabe discloses a rolling element ((12),(rolling rings of (17) and (18)) in the form of an inner bearing ring, a non-rolling element ((11),(non-rolling rings of (17) and (18)) disposed concentrically with the rolling element, the non-rolling element being in the form of an outer bearing ring, a rotation detector (26) for outputting an induced voltage produced by an input exciting voltage according to a relative rolling state of the rolling element and the non-rolling element, a generator (45) for inputting a voltage as an input exciting voltage to the rotation detector, the rotation detector including a rotor (29) provided on the rolling element, a stator (28) provided on the non-rolling element, and an exciting winding and output windings wound to the stator, wherein the output windings output the induced voltage induced according to a gap permeance between the rotor and the stator in response to the exciting voltage inputted to the exciting winding ((Figures 2-4) and (Column 4, Lines 44-62) and (Column 6, Lines 40-54 and

lines 66-67) and (Column 7, Lines 1-37) and (Column 9, Lines 19-25 and lines 55-67) and (Column 15, Lines 11-21)).

77. Watanabe does not disclose a generator for generating a voltage using energy provided by relative rotation of the rolling element relative to the non-rolling element, the generator having a first portion mounted to the inner bearing ring and a second portion mounted to the outer bearing ring, the generator including a generating rotor provided as the first portion in the rolling element by disposing magnetic poles with different polarities alternately in a circumferential direction, and a generating stator provided as the second portion in the non-rolling element and having an electric coil opposing the magnetic poles of the generating rotor in a radial direction, the electric coil producing the voltage input as the exciting voltage.

78. Okada discloses a generator (4) for generating a voltage using energy provided by relative rotation of the rolling element (2) relative to the non-rolling element (1), the generator having a first portion mounted to the inner bearing ring and a second portion mounted to the outer bearing ring, the generator including a generating rotor provided as the first portion in the rolling element by disposing magnetic poles with different polarities alternately in a circumferential direction,

and a generating stator provided as the second portion in the non-rolling element and having an electric coil opposing the magnetic poles of the generating rotor in a radial direction, the electric coil producing the voltage input as the exciting voltage ((Page 2, Paragraphs [0012], [0013] and [0017]) and (Page 14, Paragraphs [0182]-[0185]) and (Figure 19A)).

79. It would have been obvious to a person of ordinary skill in the art at the time of invention to modify Watanabe to include and add a generator for generating a voltage using energy provided by relative rotation of the rolling element relative to the non-rolling element, the generator having a first portion mounted to the inner bearing ring and a second portion mounted to the outer bearing ring, the generator including a generating rotor provided as the first portion in the rolling element by disposing magnetic poles with different polarities alternately in a circumferential direction, and a generating stator provided as the second portion in the non-rolling element and having an electric coil opposing the magnetic poles of the generating rotor in a radial direction, the electric coil producing the voltage input as the exciting voltage as taught by Okada in order to eliminate the need for a electric power supply cable so that there is no possibility that the cable can be broken, thereby eliminating any complicated and time-consuming wiring

job while contributing to the reduction in weight and cost of the vehicle (Page 2, Paragraph [0013]).

80. As to Claim 14,

81. Watanabe does not disclose a radio transmitter for radio-transmitting signals outputted from the rotation detector to a signal processing unit provided outside.

82. Okada discloses a radio transmitter for radio-transmitting signals outputted from the rotation detector to a signal processing unit provided outside ((Page 2, Paragraphs [0012], [0013]) and [0017]) and (Figure 9A).

83. It would have been obvious to a person of ordinary skill in the art at the time of invention to modify Watanabe to include a radio transmitter for radio-transmitting signals outputted from the rotation detector to a signal processing unit provided outside as taught by Okada in order to eliminate the use of cabling that can become damaged (note paragraph [0013] on page 2).

84. As to Claim 15,

85. Watanabe discloses a rolling element (12), a non-rolling element (11) disposed concentrically with the rolling element, and a rotation detector (26) for outputting an input exciting voltage by converting it to an induced voltage according to a relative rolling state of the rolling element and the non-

rolling element, the rotation detector including a rotor (29) (Figure 4), a stator (28) provided in the non-rolling element, and an exciting winding and output windings wound to the stator, wherein the output windings output the voltage induced according to a gap permeance between the rotor and the stator in response to the exciting voltage inputted to the exciting winding (note variable reluctance resolver in column 7, Lines 1-10), the stator including a plurality of polar teeth opposing the rolling element, the exciting winding and output windings being wound to each polar teeth of the stator, and the rotor including a flat portion on a portion of a circumferential surface of the rolling element, a generator (45) for generating a voltage and inputting the voltage as an input exciting voltage to the rotation detector ((Figures 2 and 4) and (Column 4, Lines 44-62) and (Column 6, Lines 40-54 and lines 66-67) and (Column 7, Lines 1-37) and (Column 9, Lines 19-25 and lines 55-67) and (Column 15, Lines 11-21)).

86. Watanabe does not disclose a radio transmitter for radio-transmitting signals outputted from the rotation detector to a signal processing unit provided outside, and the generator for generating a voltage uses energy provided by relative rotation of the rolling element relative to the non-rolling element and inputs the voltage as a driving voltage to the radio

transmitter, the generator including a generator rotor provided to the rolling element by disposing magnetic poles with different polarities alternately in a circumferential direction, and a generator stator provided to the non-rolling element and having an electric coil opposing the magnetic poles of the generating rotor in a radial direction, the electric coil producing the voltage input as the exciting voltage.

87. Okada discloses a radio transmitter for radio-transmitting signals outputted from the rotation detector to a signal processing unit provided outside, and the generator (4) for generating a voltage uses energy provided by relative rotation of the rolling element (2) relative to the non-rolling element (1) and inputs the voltage as a driving voltage to the radio transmitter, the generator including a generator rotor provided to the rolling element by disposing magnetic poles with different polarities alternately in a circumferential direction, and a generator stator provided to the non-rolling element and having an electric coil opposing the magnetic poles of the generating rotor in a radial direction, the electric coil producing the voltage input as the exciting voltage ((Page 2, Paragraphs [0012], [0013] and [0017]) and (Page 14, Paragraphs [0182]-[0185]) and (Figure 19A)).

88. It would have been obvious to a person of ordinary skill in the art at the time of invention to modify Watanabe to include and add a radio transmitter for radio-transmitting signals outputted from the rotation detector to a signal processing unit provided outside, and the generator for generating a voltage uses energy provided by relative rotation of the rolling element relative to the non-rolling element and inputs the voltage as a driving voltage to the radio transmitter, the generator including a generator rotor provided to the rolling element by disposing magnetic poles with different polarities alternately in a circumferential direction, and a generator stator provided to the non-rolling element and having an electric coil opposing the magnetic poles of the generating rotor in a radial direction, the electric coil producing the voltage input as the exciting voltage as taught by Okada in order to eliminate the need for cabling that can become damaged (see Page 2, Paragraph [0013]).

89. (It appears that the teeth of (29) (see Figure 2) appear to be flat along each tooth's right at left side, and along the top of each tooth and thus also include the flat portion feature).

90. As to Claim 16,

91. Watanabe discloses a signal processing unit for processing output signals from the rotation detector (Column 9, Lines 4-19).

92. As to Claim 17,

93. Watanabe discloses a signal processing unit for processing output signals from the generator (Column 9, Lines 4-19).

94. As to Claim 18,

95. Watanabe does not disclose a signal processing unit for processing output signals from the radio transmitter.

96. Okada discloses a signal processing unit for processing output signals from the radio transmitter (Figure 29).

97. It would have been obvious to a person of ordinary skill in the art at the time of invention to modify Watanabe to include a signal processing unit for processing output signals from the radio transmitter as taught by Okada in order to provide for a device that can determine the rotational position of the rotor with greater mobility relative to a processing device that requires cabling connected to the sensor.

98. As to Claim 19,

99. Watanabe discloses the rotation detector includes a resolver which induces the voltage according to a gap permeance between the rotor and the stator in response to an exciting voltage inputted to the exciting winding from the output

windings ((Figures 2-4) and (Column 4, Lines 44-62) and (Column 6, Lines 40-54 and lines 66-67) and (Column 7, Lines 1-37) and (Column 9, Lines 19-25 and lines 55-67) and (Column 15, Lines 11-21)).

100. As to Claim 20,

101. Watanabe discloses the non-rolling element opposes the rolling element at least in part in a radial direction of the rolling bearing apparatus (Figures 2-4).

102. Claims 14 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rigaux et al. (Rigaux) (US 5,624,192) in view of Watanabe et al. (Watanabe) (US 5,914,548) and in further view of Okada et al. (Okada) (US 2002/0130655).

103. As to Claims 14,

104. Rigaux in view of Watanable does not disclose a radio transmitter for radio-transmitting signals outputted from the rotation detector to a signal processing unit provided outside.

105. Okada discloses a radio transmitter for radio-transmitting signals outputted from the rotation detector to a signal processing unit provided outside ((Page 2, Paragraphs [0012], [0013]) and [0017]) and (Figure 9A).

106. It would have been obvious to a person of ordinary skill in the art at the time of invention to modify Rigaux in view of

Watanabe to include a radio transmitter for radio-transmitting signals outputted from the rotation detector to a signal processing unit provided outside as taught by Okada in order to eliminate the use of cabling that can become damaged (note paragraph [0013] on page 2).

107. As to Claim 18,

108. Rigaux in view of Watanabe does not disclose a signal processing unit for processing output signals from the radio transmitter.

109. Okada discloses a signal processing unit for processing output signals from the radio transmitter (Figure 29).

110. It would have been obvious to a person of ordinary skill in the art at the time of invention to modify Rigaux in view of Watanabe to include a signal processing unit for processing output signals from the radio transmitter as taught by Okada in order to provide for a device that can determine the rotational position of the rotor with greater mobility relative to a processing device that requires cabling connected to the sensor.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DAVID M. SCHINDLER whose telephone number is (571)272-2112. The examiner can normally be reached on Monday-Friday (8:00AM-5:00PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Assouad can be reached on (571) 272-2210. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

David M. Schindler
Examiner
Art Unit 2862

DMS
/Reena Aurora/
Primary Examiner, Art Unit 2862